BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 4.23

PRODUCTION PROCESS STANDARD

Pressure Testing the Learjet Model 45 Aircraft Wing Fuel System

Issue 9
- This standard supersedes PPS 4.23, Issue 8.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS 4.23 related questions to michael.wright@aero.bombardier.com.
- This PPS is effective as of the distribution date.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for pressure testing the complete fuel system of the Learjet Model 45 wing.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS must be followed to ensure compliance with all applicable specifications. In general, if this PPS conflicts with the engineering drawing, follow the engineering drawing. The requirements specified in this PPS are necessary to fulfil the engineering design and reliability objectives.

1.1.2 Refer to PPS 13.26 for the subcontractor provisions applicable to this PPS.

1.1.3 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. **do not** supersede the procedure or requirements specified in this PPS.

2 Hazardous Materials

2.1 Before receipt at Bombardier Toronto (de Havilland), all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto (de Havilland) Environment, Health and Safety Department. Refer to the manufacturer's MSDS for specific safety data on any of the materials specified in this PPS. If the MSDS is not available, contact the Bombardier Toronto (de Havilland) Environment, Health and Safety Department.

3 References

3.1 PPS 6.03 - Installation of Aircraft Fluid Lines and Fittings.

3.2 PPS 13.26 - General Subcontractor Provisions.

4 Materials and Equipment

4.1 Materials

4.1.1 Leak detector solution (e.g., Turco Leak Detector, Sigma-Aldrich Leak-Tec, MIL-L-25567, etc.). When using Turco Leak Detector solution, mix 5 oz. with water to make up 1 imp. gallon of solution. Use Leak-Tec leak detector solution as received (i.e., do not thin with water).

4.1.2 Nitrogen gas, commercial grade.

4.2 Equipment

4.2.1 DSC 378-3 lint-free wiping cloths.

4.2.2 Pressure test rig, tool #4557000001-001-141.

4.2.3 Fuel function test kit, tool #4557000001-001-216.

4.2.4 Coveralls, lint-free cotton or 65/35 polyester/cotton blend. Use of 100% cotton coveralls which are not qualified as lint-free is **not** acceptable.

5 Procedure

5.1 General

5.1.1 Install fuel system components according to PPS 6.03 and the engineering drawing.

5.1.2 All personnel working within the fuel tank must wear clean coveralls (see Equipment section, para. 4.2.4).

5.2 Set up and Operation of the Pressure Test Rig

5.2.1 Before pressure testing, ensure all calibration stickers are valid and have not expired (including pressure test rig gauge and relief valve calibration stickers and/or nitrogen cylinder regulator calibration stickers). Do not use the associated equipment if the calibration stickers are not valid or have expired.

5.2.2 The pressure test rig may be used to test two fuel line systems simultaneously using the #1 and #2 high pressure test systems.

5.2.3 Before operating the pressure test rig, ensure that both control levers are in the hold position.

5.2.4 Set up and operate the pressure test rig as follows:

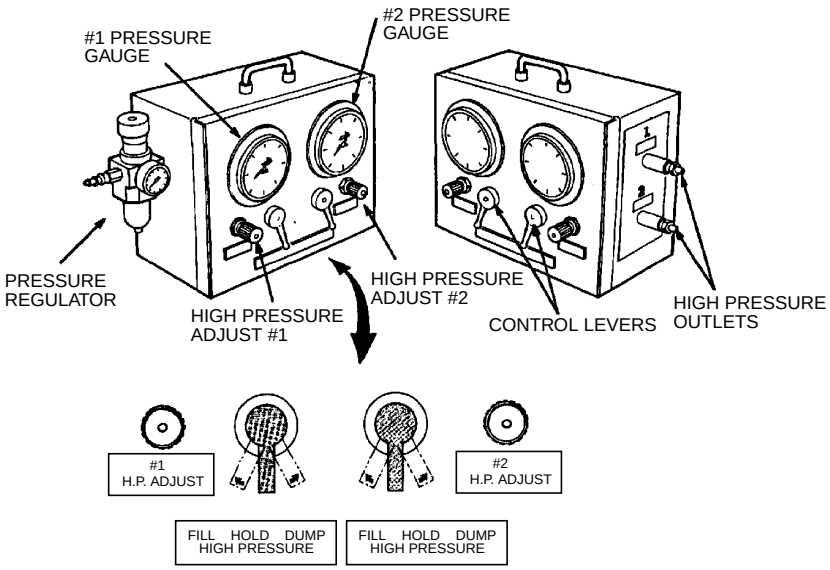

Figure 1 - Pressure Test Rig

Step 1. Connect a shop air supply and set the external air pressure regulator to 65 psig.

Step 2. Set the high pressure gauge to the test pressure specified in Table 1 by turning the high pressure adjust dial.

Step 3. Connect the pressure line from the test rig to the system that is to be tested.

Step 4. Switch the control lever to the fill position.

Step 5. When the pressure gauge indicates the correct test pressure, switch the control lever to the hold position.

Step 6. Leak detect as specified in section 5.3.

Step 7. Switch the control lever to the dump position until the pressure gauges reads zero.

Step 8. Switch the control lever to the hold position.

Step 9. Disconnect the pressure test rig line.

5.3 Pressure Test Procedure

5.3.1 General

5.3.1.1 Unless otherwise specified on the process sheet or engineering drawing, pressure test each line immediately after installation (i.e., before the installation of other lines or parts that would restrict access of the test equipment) as follows:

Step 1. Use the blanks and adapters from the fuel function test kit to blank off the fuel line to be tested.

Step 2. Except for the motive flow line, pressurize the system lines using the pressure test rig at the pressure shown in Table 1, isolating the system according to section 5.3.2 for 15 minutes and checking the pressure drop. When testing the motive flow line, apply 600 psig of pressure using a nitrogen supply.

Step 3. If there is any pressure drop during pressurization, re-pressurize the system and check for leaks using a leak test solution. Correct any leaks by re-torquing or replacing components as necessary. Re-test repaired systems according to Step 2.

Step 4. Remove residual leak test solution using a clean DSC 378-3 lint free wiping cloth dampened with clean water.

Step 5. Dry the surface with another clean DSC 378-3 lint free wiping cloth.

Step 6. Remove all blanking plugs, caps and adapters installed to facilitate testing.

Step 7. Re-connect all lines and fittings.

Step 8. Torque re-connected joints according to PPS 6.03.

Table 1 - Pressure Testing Learjet Model 45 Wing Fuel Systems

SUB-SYSTEM	ISOLATION PROCEDURE (Note 1)	TEST PRESSURE
Refuel Line	para. 5.3.2.1	60 psig
Vent Line	para. 5.3.2.2	10 psig
High Pressure Motive Line	para. 5.3.2.3	600 psig
Scavenge Return Lines	para. 5.3.2.4	10 psig
Transfer & Engine Feed Line	para. 5.3.2.5	50 psig
Note 1: All motorized valves must be opened manually.		

5.3.2 Isolation of Lines & Systems

5.3.2.1 Isolate the **refuel line** as follows (see Figure 2):

Step 1. Disconnect the refuel line at station X48 on the inboard side of the collector bay.

Step 2. Blank off the refuel line using a W907-24 Wiggins cap.

Step 3. Close the refuel drain line shut-off valve.

Step 4. Connect the pressure test rig to the refuel line where it exits the rear spar and apply pressure.

5.3.2.2 Isolate the **vent line** as follows (see Figure 3):

Step 1. Plug the outboard end of the vent line using a #2 rubber stopper.

Step 2. Close the vent drain line shut-off valve.

Step 3. Connect the pressure test rig to the inboard end of the vent line and apply pressure.

5.3.2.3 Isolate the **high pressure motive line** as follows (see Figure 4):

Step 1. Disconnect the motive line from the outboard scavenge pump at the tee on rib 10 and cap the tee using an AN924-4 cap assembly.

Step 2. Disconnect the motive line from the tee on rib 4 and cap using an AN924-4 cap.

Step 3. Disconnect the motive line for the main ejector pump located within the collector bay and cap the line using an AN924-6 cap.

Step 4. Disconnect the motive line for the inboard forward main tank scavenge pump, located within the main tank and cap the line using an AN924-4 cap.

Step 5. Disconnect the motive line for the refuel system assist pump and cap the line using an AN924-4 cap.

Step 6. Connect the nitrogen cylinder supply to the motive line where it exits the rear spar and apply pressure.

5.3.2.4 Isolate the **scavenge return lines** as follows (see Figure 5):

Step 1. Disconnect the scavenge line from the outboard main tank scavenge pump on the forward side of the mid spar.

Step 2. Plug the scavenge line where it enters the collector bay using a #8 rubber stopper.

Step 3. Connect the pressure test rig to the scavenge line and apply pressure.

Step 4. Disconnect the scavenge line from the aft inboard main tank scavenge pump.

Step 5. Plug the scavenge line where it enters the collector bay using a #8 rubber stopper.

Step 6. Connect the pressure test rig to the scavenge line and apply pressure.

Step 7. Disconnect the scavenge line from the forward collector tank scavenge pump.

Step 8. Plug the scavenge line on the aft side of the collector bay using a #8 rubber stopper.

Step 9. Connect the pressure test rig to the scavenge line and apply pressure.

5.3.2.5 Isolate the **transfer and engine feed line** as follows (see Figure 6):

Step 1. Disconnect the transfer line from the aux electric pump from both port and starboard fuel tanks and cap the starboard line with an AN929-16 cap.

Step 2. Close the engine feed/transfer drain line shut-off valves in both tanks.

Step 3. Ensure that the motorized shut-off valves are open in both tanks. The valves are normally in the open position.

Step 4. Cap each engine feed line where it exits at the rear spar with an AN929-16 cap.

Step 5. Disconnect main pumps and cap lines with AN929-16 caps.

Step 6. Connect the pressure test rig to the transfer line at the auxiliary electric pump (port side facing aft).

Step 7. Close off the engine feed/transfer drain line shut-off valve.

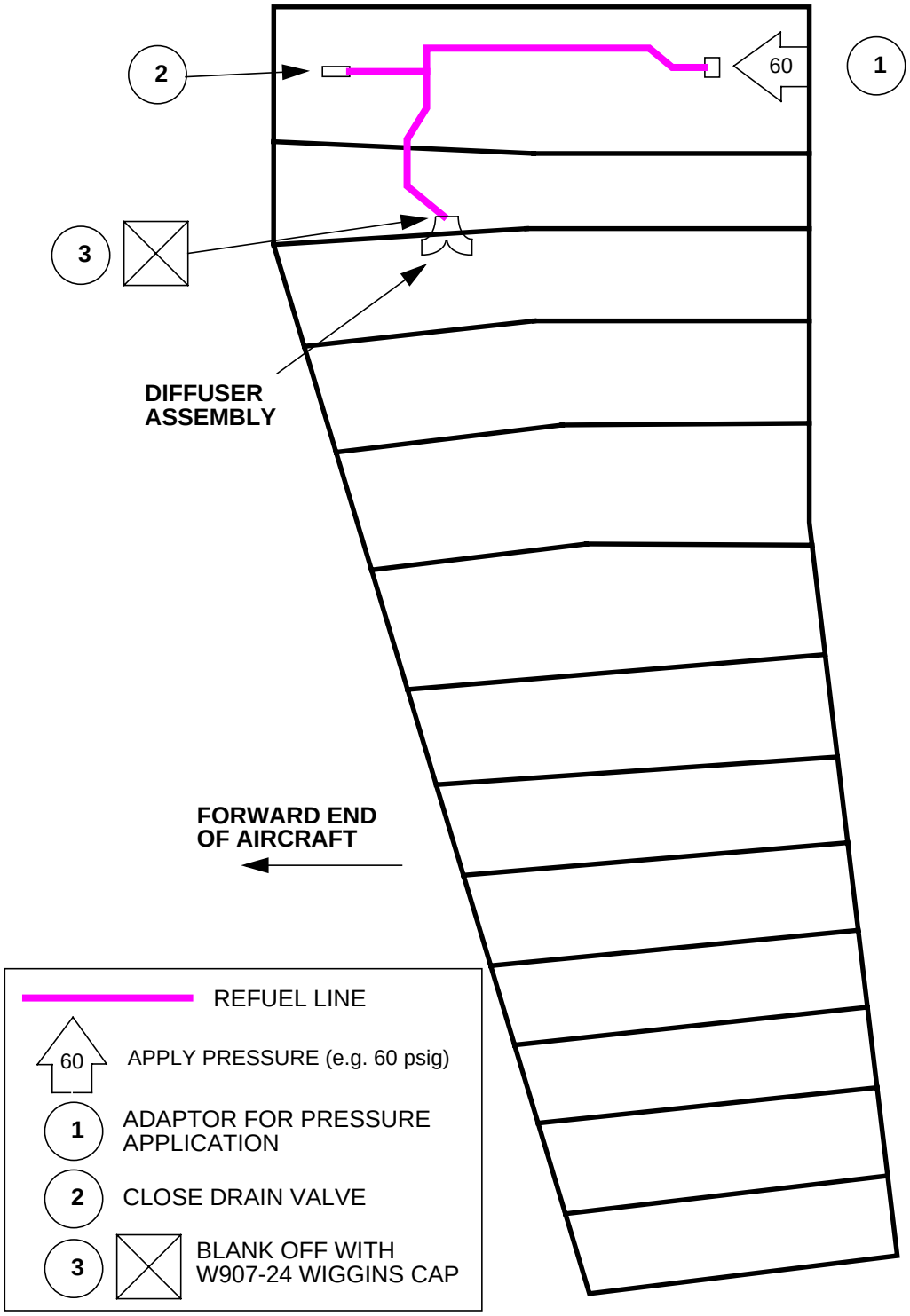

Figure 2 - Refuel Line Pressure Test

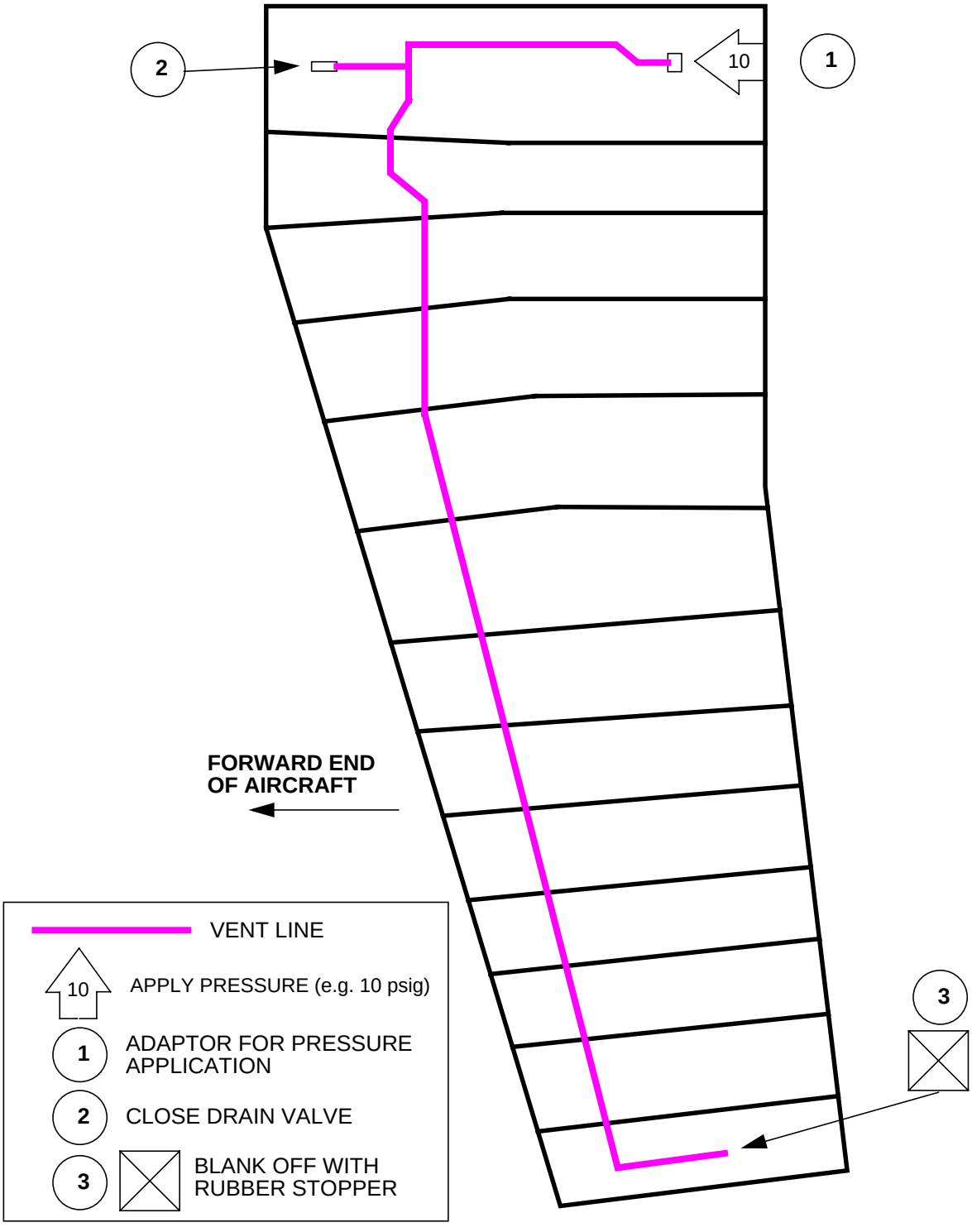

Figure 3 - Vent Line Pressure Test

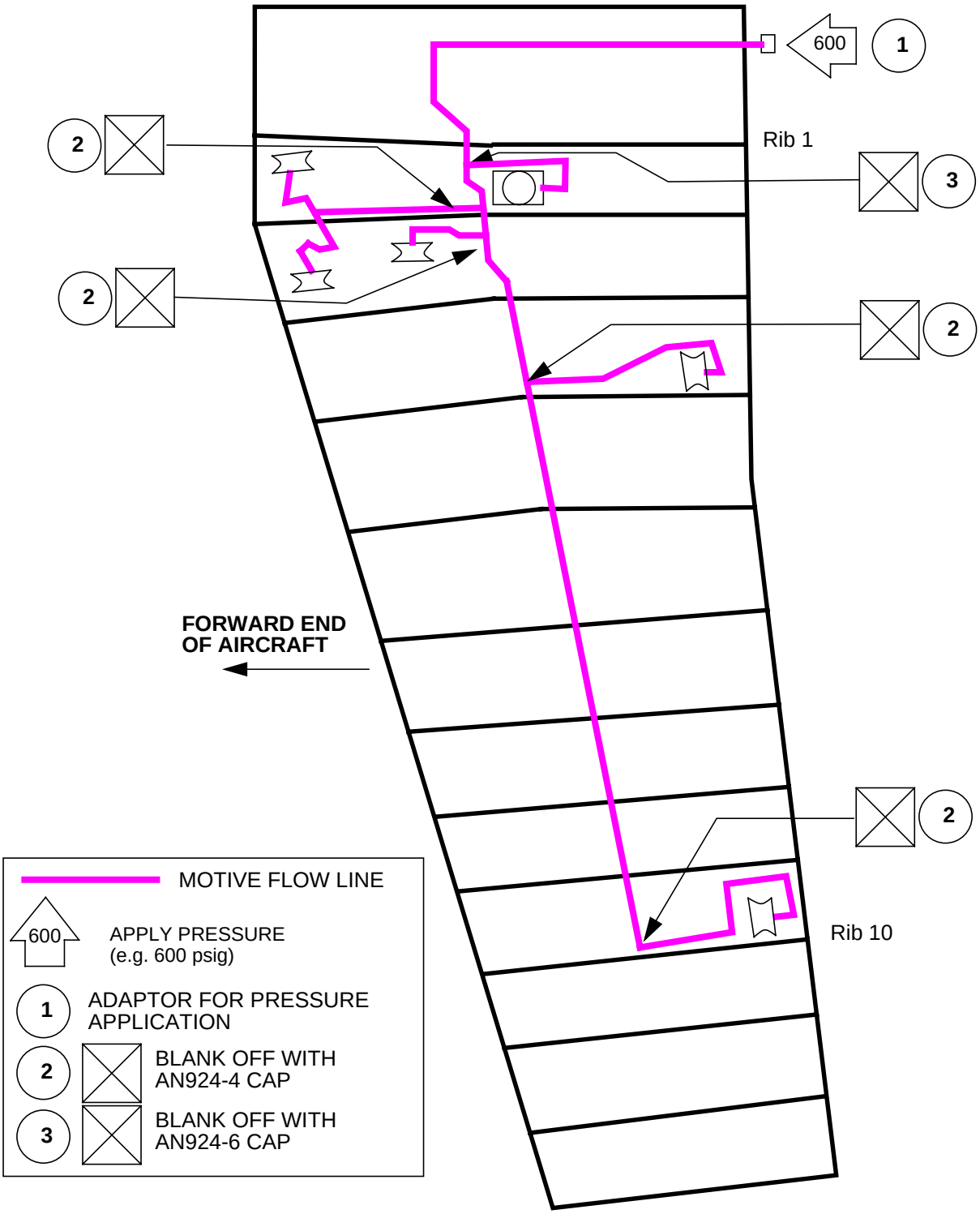

Figure 4 - Motive Line Pressure Test

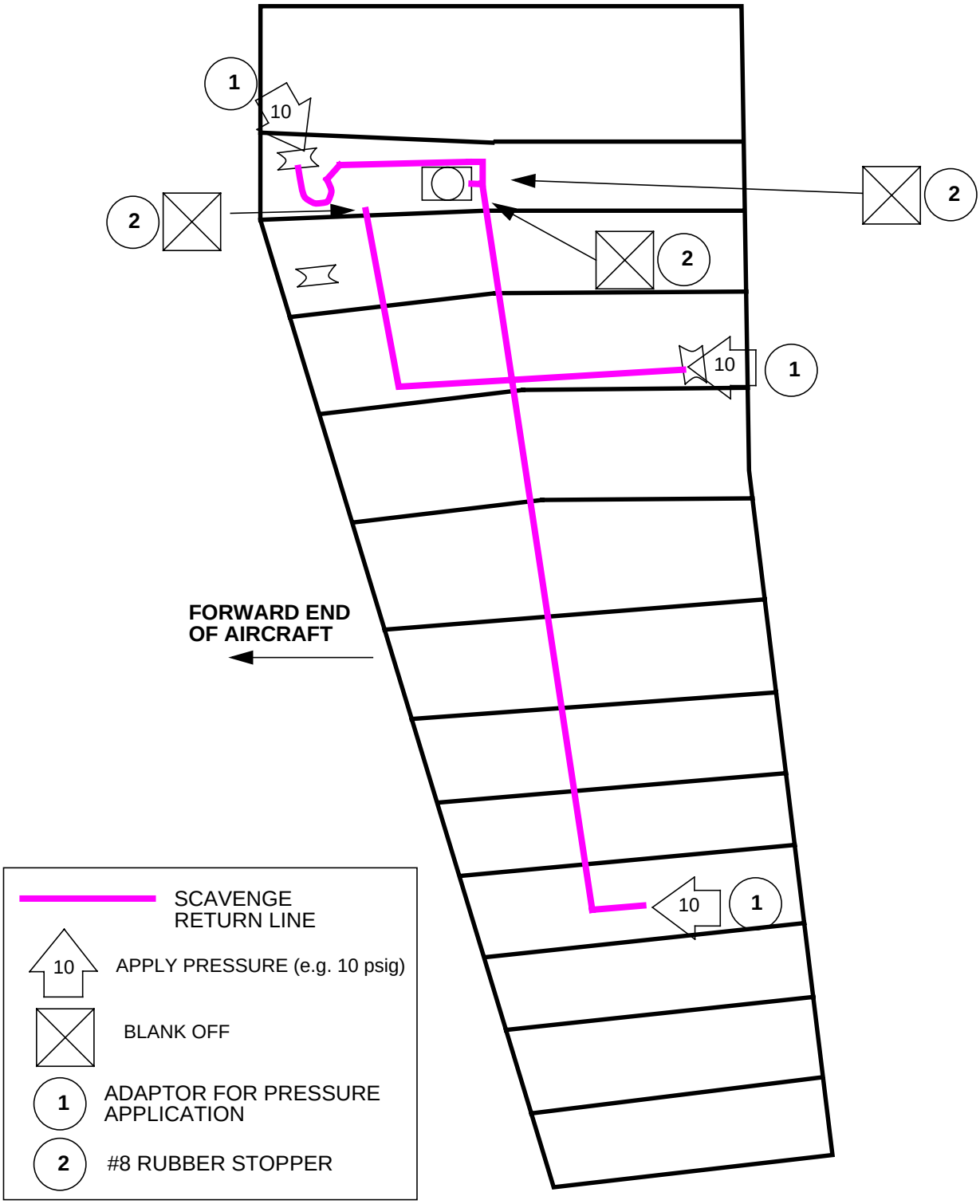

Figure 5 - Scavenge Return Line Pressure Test

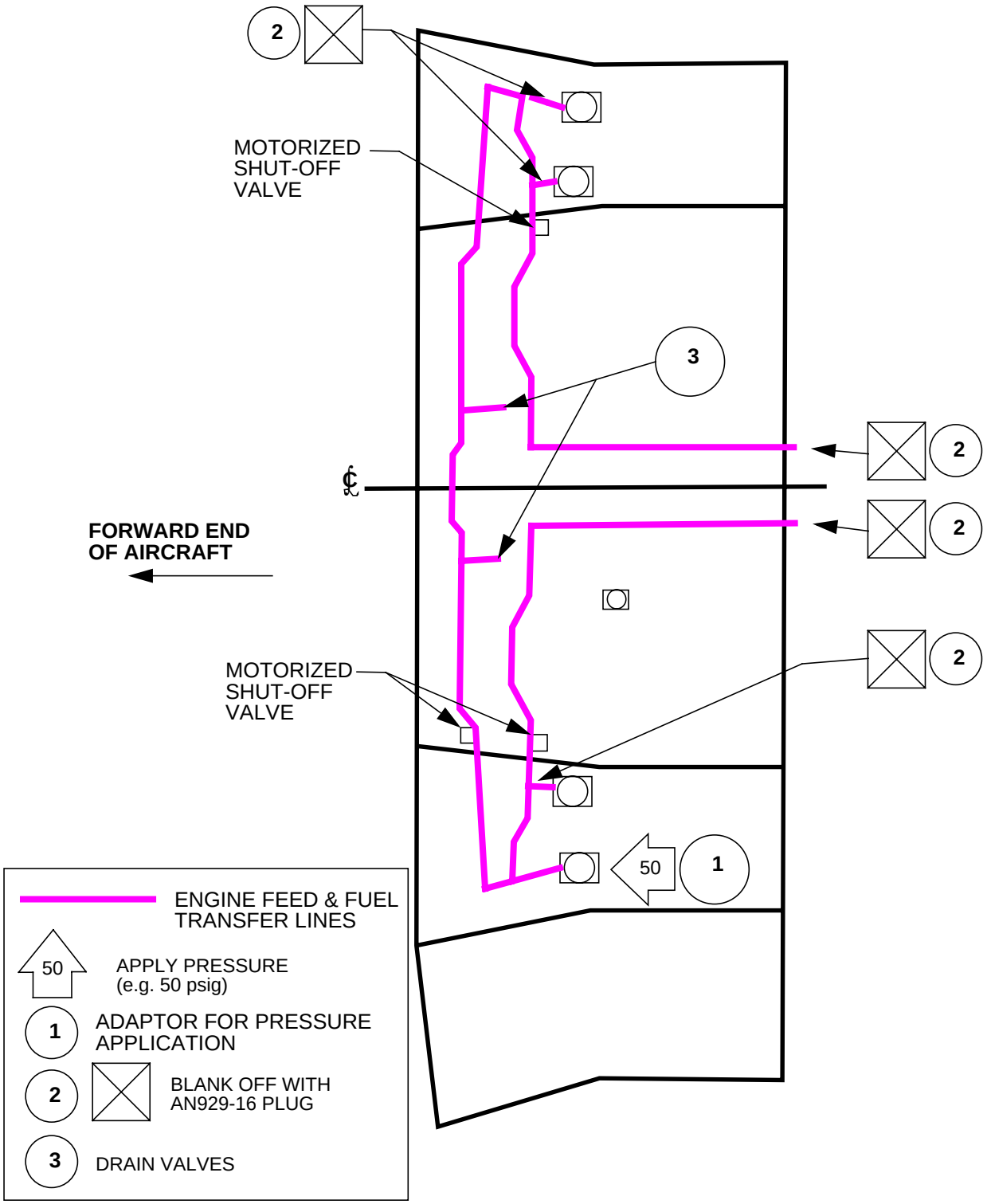

Figure 6 - Engine Feed & Fuel Transfer Line Pressure Test

6 Requirements

6.1 All fuel system lines in the integral fuel tanks must be pressure tested according to Table 1 before filling the tanks with fuel.

6.2 No pressure drop is allowed during the 15 minute isolation test.

6.3 During the pressure test, do not release the pressure in the fuel system at any time before removing the leak test solution. Leak test solution must be removed by thoroughly washing with clean water.

6.4 Ensure pressure tested fuel systems show no signs of leaks.

7 Safety Precautions

7.1 The safety precautions specified herein are specific to Bombardier Toronto to meet Canadian Federal and Provincial government environmental, health and safety regulations. It is recommended that other facilities consider these safety precautions; however, suppliers, subcontractors and partners are responsible for ensuring that their own environmental, health and safety precautions satisfy the appropriate local government regulations.

7.2 Observe general shop safety precautions when performing the procedure specified herein.

7.3 Rapid release of nitrogen gas into an enclosed space can displace oxygen (e.g., in the event of a major leak or damage to the nitrogen cylinder), and therefore presents an asphyxiation hazard.

- **Ensure working areas are provided with adequate ventilation.**
- **In case of a major leak or damage to the nitrogen cylinder, clear the area and contact Emergency Services (Bombardier Toronto telephone extension 33111).**
- **Take care to avoid damage to nitrogen cylinders.**
- **Use a suitable lifting/carrying device such as a hand truck to move nitrogen cylinders; do not drag, roll, slide or drop.**
- **Ensure cylinders are secured at all times during transportation, storage and use.**
- **The cap is intended solely to protect the valve. Never attempt to lift a nitrogen cylinder by its cap. Hand tighten the valve protection cap when cylinders are not in use.**
- **Compressed gas cylinders (full or empty) must be stored only in approved locations away from stairs, elevators, evacuation routes and exits, when not in use.**

7.4 Always take extreme care when pressurizing the fuel system to ensure the test rig lines are kept clear of structures, stands, etc., and free of kinks or loops that may restrict air flow through such lines.

7.5 Do not leave the pressure test rig unattended while connected to the shop air supply.

8 Personnel Requirements

8.1 Personnel must have a good working knowledge of the applicable procedure and requirements as specified herein and must have exhibited their competency to their supervisor.

9 Maintenance

9.1 Ensure that the pressure test rig is calibrated at least once every 4 months.

9.2 Check the test rig system for leaks and security of joints. Check gauges and pressure relief valves for accuracy.

9.3 Ensure nitrogen cylinder regulators that are to be used for the motive line 600 psig pressure test are calibrated.